

Reg.No.: 

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN  
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]  
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 80009**

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024

Fifth Semester

Electrical and Electronics Engineering

U19EE517 – POWER SYSTEM PROTECTION AND SWITCHGEAR

(Regulation 2019)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define the 'selectivity' property with respect to protective relays.	2	K1	CO1
2.	How are the 'ground wires' terminated in overhead lines?	2	K2	CO1
3.	What element is used for the reference/pick-up value in electro-mechanical based over-current relays? Why?	2	K2	CO2
4.	List the advantages of static relays over electro-mechanical relays.	2	K1	CO2
5.	What type of relay is majorly used for the protection of power transformers? Why?	2	K2	CO3
6.	Why do we need to make over-lapping between two adjacent zones of protection?	2	K2	CO3
7.	Which one of the following can be more simple and effective : (a) AC Circuit Breaking (b) DC Circuit Breaking. Write the reason for your choice.	2	K1	CO4
8.	What is restriking voltage in the process of arc quenching in circuit breakers?	2	K1	CO4
9.	List the major specifications of an AC circuit breaker.	2	K1	CO5
10.	Mention and infer anyone property of Oil, which necessiates the Oil to be used in the circuit breaker.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	List and explain all the essential properties of power system protection system.	13	K1	CO1
	(OR)			
b)	Discuss the internal causes of over-voltage in transmission lines. Mention and brief anyone method to protect end apparatus when such over-voltage occurs in the transmission line.	13	K1	CO1
12. a)	Explain the principle of operation of induction type over-current relay with essential diagram. Further, explain the process of obtaining IDMT characteristic in the same induction type relay.	13	K2	CO2
	(OR)			
b)	With the help of schematic diagram and flowchart, explain the function of a micro-processor based impedance relay.	13	K2	CO2
13. a)	A three-phase, 66kV/11kV power transformer is connected in star-delta. The transformer is protected by Merz-Price circulating current method. Protection CT on LV side has a ratio of 250/5. Find the ratio of the CTs on the HV side. Draw the same scheme neatly with computed numerical values and explain the operation of the scheme under internal and external faults.	13	K3	CO3
	(OR)			
b)	The neutral point of a 11 kV alternator is earthed through a resistance of 12 $\Omega$ , the relay is set to operate when there is out of balance current of 0.8 A. The CTs have a ration of 200/5. What percentage of winding is protected against earth faults? What must be the minimum value of earthing resistance required to give 90% protection for each phase.	13	K3	CO3
14. a)	Explain and derive the terms restriking voltage and RRRV when arc interruption happens during circuit breaker operation.	13	K2	CO4
	(OR)			
b)	Write a short note on following: (a) Current chopping (b) Interruption of capacitive current	13	K2	CO4

15. a) List and explain the physical and chemical properties of SF<sub>6</sub> used in circuit breakers. 13 K1 CO5

(OR)

b) With essential diagrams write short notes on the following: 13 K1 CO5  
 (a) MCCB  
 (b) RCCB

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	For the one-line diagram given in Fig. 1, draw and show the proper setting of distance relay scheme which would avoid over-reaching problem between the substation 'B' and 'C'. Justify the selection and settings. Also indicate issues related to this scheme. Also draw the characteristics of distance relay at 'B' in the R-X plane.	15	K3	CO2

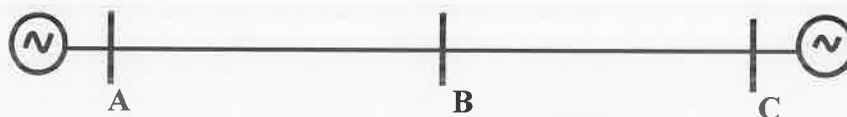


Fig.1

(OR)

b) An alternator stator winding is protected by a percentage differential relay as given in Fig.2. The relay is set to operate with a minimum pick-up of 0.2 A and bias setting of 10%. A high resistance fault occurs close to the grounded neutral while carrying the load. Assume the CT ratios as 400:5. Will the relay operate? Show the appropriate computation and show the operating characteristics and operating points numerically. Also obtain the minimum slope required for the relay to operate in the given situation.

